

START

ENGINEERING CHANGE NOTICE

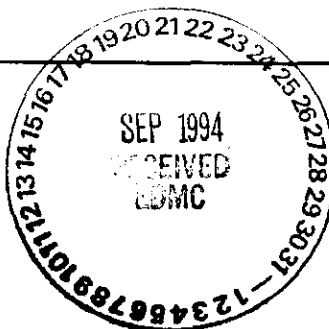
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1. ECN 602620

Proj.
ECN N/A

2. ECN Category (mark one) Supplemental <input checked="" type="checkbox"/> Direct Revision <input type="checkbox"/> Change ECN <input type="checkbox"/> Temporary <input type="checkbox"/> Standby <input type="checkbox"/> Supersede <input type="checkbox"/> Cancel/Void <input type="checkbox"/>		3. Originator's Name, Organization, MSIN, and Telephone No. B. A. Williams/Groundwater Management/H6-06/376-3416		4. Date 09/01/94	
		5. Project Title/No./Work Order No. RCRA Assessment Well		6. Bldg./Sys./Fac. No. 216-U-12 Crib	
		8. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-EN-AP-108, Rev. 0		9. Related ECN No(s). N/A	
				7. Approval Designator EQ	
				10. Related PO No. N/A	
11a. Modification Work [] Yes (fill out Blk. 11b) [X] No (NA-Blks. 11b, 11c, 11d)		11b. Work Package No. N/A		11c. Modification Work Complete N/A	
		Cog. Engineer Signature & Date		11d. Restored to Original Condition (Temp. or Standby ECN only) N/A	
		Cog. Engineer Signature & Date			
12. Description of Change See attached.					
13a. Justification (mark one) Criteria Change [] Design Improvement [] Environmental [X] As-Found [] Facilitate Const. [] Const. Error/Omission [] Design Error/Omission []					
13b. Justification Details See attached.					
14. Distribution (include name, MSIN, and no. of copies) See Distribution Sheet.				RELEASE STAMP OFFICIAL RELEASE 41 BY WHC DATE SEP 02 1994 B. A. Williams	

A-7900-013-2 (06/94) GEF095



A-7900-013-1 (06/92)

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1. ECN (use no. from pg. 1)

602620

15. Design Verification Required

☐ Yes

☒ No

16. Cost Impact

ENGINEERING

CONSTRUCTION

Additional

☐

\$

Additional

☐

\$

Savings

☐

\$

Savings

☐

\$

17. Schedule Impact (days)

Improvement

☐

Delay

☐

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	<input type="checkbox"/>	Seismic/Stress Analysis	<input type="checkbox"/>	Tank Calibration Manual	<input type="checkbox"/>
Functional Design Criteria	<input type="checkbox"/>	Stress/Design Report	<input type="checkbox"/>	Health Physics Procedure	<input type="checkbox"/>
Operating Specification	<input type="checkbox"/>	Interface Control Drawing	<input type="checkbox"/>	Spares Multiple Unit Listing	<input type="checkbox"/>
Criticality Specification	<input type="checkbox"/>	Calibration Procedure	<input type="checkbox"/>	Test Procedures/Specification	<input type="checkbox"/>
Conceptual Design Report	<input type="checkbox"/>	Installation Procedure	<input type="checkbox"/>	Component Index	<input type="checkbox"/>
Equipment Spec.	<input type="checkbox"/>	Maintenance Procedure	<input type="checkbox"/>	ASME Coded Item	<input type="checkbox"/>
Const. Spec.	<input type="checkbox"/>	Engineering Procedure	<input type="checkbox"/>	Human Factor Consideration	<input type="checkbox"/>
Procurement Spec.	<input type="checkbox"/>	Operating Instruction	<input type="checkbox"/>	Computer Software	<input type="checkbox"/>
Vendor Information	<input type="checkbox"/>	Operating Procedure	<input type="checkbox"/>	Electric Circuit Schedule	<input type="checkbox"/>
OM Manual	<input type="checkbox"/>	Operational Safety Requirement	<input type="checkbox"/>	ICRS Procedure	<input type="checkbox"/>
FSAR/SAR	<input type="checkbox"/>	IEFD Drawing	<input type="checkbox"/>	Process Control Manual/Plan	<input type="checkbox"/>
Safety Equipment List	<input type="checkbox"/>	Cell Arrangement Drawing	<input type="checkbox"/>	Process Flow Chart	<input type="checkbox"/>
Radiation Work Permit	<input type="checkbox"/>	Essential Material Specification	<input type="checkbox"/>	Purchase Requisition	<input type="checkbox"/>
Environmental Impact Statement	<input type="checkbox"/>	Fac. Proc. Samp. Schedule	<input type="checkbox"/>	Tickler File	<input type="checkbox"/>
Environmental Report	<input type="checkbox"/>	Inspection Plan	<input type="checkbox"/>		<input type="checkbox"/>
Environmental Permit	<input type="checkbox"/>	Inventory Adjustment Request	<input type="checkbox"/>		<input type="checkbox"/>

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision

Document Number/Revision

Document Number Revision

20. Approvals

Signature

Date

Signature

Date

OPERATIONS AND ENGINEERING

Cog. Eng. B. A. Williams

Cog. Mgr. J. S. Schmid

QA W. R. Thackaberry

Safety

Environ.

Other D. J. Carrell

B. A. Williams 9/1/84
J. S. Schmid 9/1/84
W. R. Thackaberry 9-2-84

"E" Review 9/1/84 D. J. Carrell

ARCHITECT-ENGINEER

PE

QA

Safety

Design

Environ.

Other

DEPARTMENT OF ENERGY

Signature or a Control Number that tracks the Approval Signature

M. J. Furman

ADDITIONAL

M. J. Furman 9/1/84

9/1/84

12. DESCRIPTION OF CHANGE:

ADD to Pg. 9,

5.7 PHASE II -- PLUME INVESTIGATION

The purpose of Phase II assessment is to identify the migration rate and extent of the contaminant plume(s) sourced by the 216-U-12 Crib.

The available information on groundwater plumes in the area surrounding the U-12 Crib is limited due to the minimal number of groundwater wells or investigative boreholes downgradient of the crib (WHC-SD-EN-TI-020, Rev. 0. Groundwater Field Characterization of the 200 Aggregate Area Management Study, 6/93). Also the hydrogeology of the total unconfined aquifer is not well defined. Only one old borehole (installed pre-1980s) penetrates the base of the aquifer into the confining intervals.

Phase II plume evaluation will rely on process knowledge and disposal histories of the 216-U-12 Crib. This evaluation will also rely on strategies and modeling developed both under RCRA and from the 200-UP-1 Operable Unit Project (CERCLA) which is providing regional plume mapping and remedial investigations of the U-Plant waste disposal activities in the area. . The information provided in the WIDS and in the Groundwater Monitoring plan, WHC-SD-EN-AP-019, Rev.0, provides the timing of release of the waste effluent, including volumes, and specific constituents. Groundwater information from past and ongoing monitoring for wells in the area will also be evaluated to determine timing of the passing of the plume(s) through the area. This data could supplement and aid in distinguishing between other similar plumes in the area not related to the 216-U-12 Crib.

Existing plumes can be utilized to calculate flow velocities for comparison with expected and calculated results from hydraulic conductivity measurements for the area (WHC-SD-EN-TI-014, Rev. 0, Hydrogeologic Model for the 200 West Groundwater Aggregate Area).

Groundwater contaminant transport modeling will be utilized as a predictive tool to estimate the possible range of down gradient spreading. This tool will be useful in targeting the plume for further subsurface investigation.

5.7.1 Phase II -- Drilling and Well Installation

Limited subsurface data in the area downgradient of the U-12 Crib requires additional drilling to characterize the hydrogeology and the extent of the plume. One groundwater monitoring well is proposed to begin this investigation. The discovery process will determine the need and location for additional boreholes. Figure 1 provides the approximate location of the proposed well.

This borehole will be located based on the results of the plume targeting effort outlined in the previous section. Other beneficiaries of this well will be the Multi-Function Waste Tank Facility being constructed in this general area downgradient of the contaminants sourced by the U-12 Crib (and presumably the U-8 Crib). This well will be the only groundwater monitoring well available and capable of determining the nature of contaminants in the groundwater near the new tank farm. This well may also serve as an upgradient monitoring point for the ERDF Project and will support ongoing CERCLA cleanup activities.

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Previous characterization activities for the U-12 Crib were not adequate to determine the hydrogeology to the base of the unconfined aquifer. Therefore, the drilling depth of investigation requirements has been based on cross-section studies of wells in the area. Section studies reveal the Ringold lower mud unit as the probable lower confining unit for the uppermost aquifer which is primarily within the Ringold E Unit. The Elephant Mountain basalt is described as the regional lower confining unit but locally the Ringold lower mud unit exhibits semiconfining conditions and is selected as the target zone for this investigation due to the depth to basalt and the thickness of the Ringold E aquifer interval.

Approximately 160' of saturated sands and gravel comprise the Ringold E unit. Soil sampling and analysis will be conducted to completely characterize this upper interval. The proposed total depth of the borehole is 430'. Sufficient drilling of at least 10' into the lower confining unit will allow for confirmation of the continuity of the zone and for sampling and geophysical logging. The water table is at a depth of approximately 245'.

Well drilling and construction design specifics will be provided to the drilling contractor via a Data Sheet as per the WHC-S-014, Rev, 7. The well will be drilled utilizing air rotary or cable tool techniques as specified in the Generic Well Specification, WHC-S-014, Rev, 7, and following applicable procedures as outlined in the WHC -CM-7-7.

When the borehole characterization is completed it will be back filled with bentonite to within 35' of the water table (approximately 180'). A shallow groundwater monitoring well will then be constructed following construction requirements as provided in the Generic well specification. When completed this well will meet the requirements for a RCRA compliant resource protection well as defined in the WAC 173-160. The well will be constructed with a stainless steel well screen with silica sand filter pack and stainless steel casing sealed throughout the vadose zone. The well will be equipped with a surface pad with protective, locking surface cap and posts, and contain a dedicated sampling pump.

5.7.2 Phase II -- HYDROGEOLOGIC CHARACTERIZATION

The primary contaminant migration pathway is within the upper most saturated interval, also the unconfined aquifer, which comprises most of the Ringold E gravel. Therefore the majority of the characterization and sampling activity will focus on the geologic and hydrologic characteristics of this interval. Table 1 provides a summary of the data parameters to be collected during this investigation in support of the DQOs. The sampling intervals and techniques described below are planned activities which may be changed at the discretion of the well site hydrogeologist as conditions warrant.

As part of the upper aquifer characterization effort soil samples will be collected at every 5' in the borehole or at changes in lithology to provide a geologic description, including mineralogy, grain size distribution, etc, of the formations present. Sample material will also be collected and screened for radiation activity. Radiological screening will allow release of samples for laboratory analysis and provide a quality indicator of potential radio-isotope activity in the subsurface. In addition to the rad samples, soil cuttings or excess sample material (spoon liners or core) will be archived for future reference or analysis.

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Vadose sampling

SOIL-PHYSICAL/CHEMICAL

The only soil analytical samples collected within the vadose zone will be those selected on the basis of need to supplement the existing vadose data at the U-12 facility. This may include soil moisture data and calcium carbonate concentrations collected at changes in lithology within the fine grained facies of the lower Hanford and Plio-Pleistocene. This interval is documented as a significant perching horizon within the 200 West area including the U-12 Crib. The perching is probably due to a combination of reduced flow through finer grained sediments and a zone of calcium carbonate cementation.

One split spoon will be collected to analyze for the hydrologic properties: 1) unsaturated vertical hydraulic conductivity, 2) moisture retention, 3) porosity, and 4) bulk density.

No further chemical or radiological analysis will be performed on samples within the vadose zone unless anomalous conditions warrant further investigation. This plume is over 750 meters from the U-12 Crib and historical data does not reveal any other waste disposal activities in this area.

SATURATED ZONE SAMPLING

SOIL- PHYSICAL/CHEMICAL

To evaluate the variability in cementation and sediment sorting in the Ringold E sediments and the lower mud of the saturated interval 5' grab samples will be analyzed for calcium carbonate concentration and grain size distribution.

Due to the variability and heterogeneity of the gravel and sands of the Ringold units and the unavailability of other alternative means of obtaining insitu undisturbed samples for the analysis of hydrogeologic parameters, split spoon sampling techniques will be used. The successful recovery of samples will depend variably on the materials encountered and is dependent on the grain size and cementation of these materials.

Soil split spoon samples will be collected over 160' of the saturated interval at approximately every 40 feet or at changes in lithology and analyzed for bulk density/porosity, particle size distribution, hydraulic conductivity.

GROUNDWATER - CHEMICAL/RAD

The groundwater will be sampled throughout the 160' of saturated interval and analyzed to determine the natural constituent concentrations and the vertical distribution and concentrations and/or activity levels of the contaminants. Some of the analytes selected for analysis were based on known contaminants released to the groundwater from the U-12 Crib plus other contaminant plumes documented in the area. The reactivity of the groundwater and soils within the saturated interval will also be determined to ascertain contaminant retardation and its relationship to groundwater flow velocities. A list of chemical and radiological constituents and associated analytical procedures is provided in Table 2.

A groundwater sampling device, capable of isolating discrete intervals, will be utilized to pack-off and sample the groundwater at approximately every 20' of depth or at noticeable changes in permeability. Rapid turnaround and field testing of some of the

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analytes will be required to provide the information needed for decision making at the wellsite. This includes depth placement and screen length for well construction, and contaminant migration indicators.

OPTIONAL SAMPLING TECHNIQUES

Optional insitu sampling techniques such as core drilling may be utilized for soil sampling, in lieu of split spoon sampling, if it becomes available. While this technology has not been successfully applied to air rotary drilling at Hanford it offers the ability to recover larger sections of formation, intact and undisturbed. The risk of not being able to sample a formation is also significantly reduced.

GEOPHYSICAL LOGGING

While subsurface geophysical techniques developed and available at Hanford are limited due to downhole conditions these evaluation tools can still be useful in characterizing the subsurface regime.

Geophysical logging, utilizing the gross gamma (NaI) and possibly the RLS spectral gamma probes, will be performed to aid in hydrogeologic correlations and to screen for radioactive contaminants in the vadose and saturated intervals. The gross gamma log will be utilized to add accuracy and confidence to the geologic model. Improved identification and location of formation boundaries and subtle changes in depositional units is possible because of the continuous curve trace provided in the data log.

The gamma log will also identify anomalous intervals which are not related or explained by the geology. If anomalous regions are discovered the RLS spectral gamma probe will then be used to provide positive identification and quantification of the manmade or natural constituent(s) contributing to the anomaly. This data will then supplement the groundwater radiological results to accurately locate and identify concentration changes within the formation and aid in interpreting the relationship between the geology and hydrology of the aquifer.

Gross Gamma (NaI) Logging will be performed after each temporary string of casing is placed and prior to downsizing for the next phase of drilling. If anomalous regions are identified the RLS logging system will be run prior to well completion to evaluate the anomaly. After completion of the well an optional final log run could be made to establish a baseline for future comparative purposes. The decision for this a final run will be made after evaluation of the logs and well data. The decision to run a final log will depend primarily on the presence and potential of contaminants migrating through the vadose interval.

AQUIFER TESTING AND FLOWMETER EVALUATION

Aquifer testing will be performed at selected intervals to determine the hydraulic flow distribution within the aquifer. The assessment of the contaminant plumes flow direction and rate of migration is highly dependent on the availability of these aquifer parameters. Limited well control in the area downgradient of the U-12 Crib reduces the accuracy with which these parameters can be evaluated.

Because of the lack of observation wells in the area needed to support pumping tests and the disposal costs associated for large volumes of potentially contaminated purge water, slug injection testing utilizing gas or liquid slugging methodology will be conducted. The inherent variability within the Ringold E gravels create zones of variable

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groundwater flow. Slug injection testing may be conducted coincident with splitspoon sample intervals to provide additional data for the confirmation and validation of hydraulic flow parameters derived from laboratory analysis of insitu soil samples. Continuous water level indicators will transmit and record water level response data before, during, and after the testing. This data will be evaluated using the techniques developed by Bouwer and Rice (Rice, 1976(A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells, June 1976, Herman Bouwer and R. C. Rice, Water Resources Research, vol.12, No.3))

Downhole Flowmeter measurements can accurately measure groundwater flow direction and rate. These measurement will be collected from the screened interval when the well is completed. Additional measurements may be made during drilling if the supporting equipment is available. The flowmeter measurements will support and validate data derived from slug testing and soil analytical results (hydraulic conductivity). This data will also be compared to head measurements (water table gradients) for the area to confirm groundwater flow directions and ascertain the accuracy.

GROUNDWATER SAMPLING AND ANALYSIS

After the completion of new groundwater monitoring wells, sampling and analysis plans, schedules, and constituent lists will be developed. These plans will include contaminants known to exist in the area, will be integrated to with other operations, and contain regulator required parameters. This plan will be completed as an ECN to the assessment plan.

IMPLEMENTATION OF FUTURE PHASES

The delineation and evaluation of the 216-U-12 plume(s) will continue and additional phases of drilling will be identified based on the results of the Phase II investigation.

The 216-U-12 Crib assessment will eventually be integrated with CERCLA UP-1 Operable Unit cleanup and closure activities. The transition of responsibility from RCRA to CERCLA has yet to be negotiated with the regulators.

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13b. Justification Details

The 216-U-12 Crib has been in assessment groundwater monitoring for hazardous contaminants under RCRA assessment monitoring requirements, 40 CFR 265.93 (d), since the first quarter of CY 93. As summarized in the RCRA Annual Report, DOE/RL-93-88, Section 4.3, groundwater contamination detected in two downgradient wells is being assessed to determine the contributing chemical constituents, source, and rate and extent of migration.

The Phases of this assessment are outlined in the Interim Status Groundwater Quality Assessment Plan for the 216-U-12 Crib, WHC-SD-EN-AP-108, rev. 0, released January 28, 1993. Phase I of this assessment deals with identifying the source of the contamination and the individual contaminants impacting the groundwater below the crib.

This ECN provides the justification, location, and sampling and analysis requirements for Phase II assessment well(s). It supports the delineation and location of the contaminant plume(s) and includes the drilling of one additional borehole for characterization and groundwater monitoring.

Based on data collected to date it can be shown that the contamination is a result of high concentrations of nitrates and associated radioisotopes (Tech-99) released to the groundwater from disposal practices at the 216-U-12 Crib. This interpretation and the supporting evaluation will be released in the forthcoming groundwater assessment report. The conclusion of this evaluation is to move into phase II and proceed with delineating and defining the plume(s) through the drilling of investigative boreholes.

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TABLE 1. SEDIMENT SAMPLING REQUIREMENTS -

<u>Sediment Analysis</u>	<u>GEL Code</u>	<u>Estimated Samples</u>
Hydrometer/Sieve	(GEL-07)	3
Calcium Carbonate	(GEL-19)	50
Bulk Density/Porosity	(GEL-16)	6
Unsaturated Hydraulic Cond	(N/A)	1
Saturated Hydraulic Cond	(GEL-09)	6
Moisture retention	(GEL-17)	1

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Table 2. WATER SAMPLING REQUIREMENTS -

<u>Analysis Category</u>	<u>Reference Method</u>	<u>Constituents</u>
1. Field parameters (samples)		Temp, pH, Dissolved oxyg (all field redox pot, turbidity, sp cond (TDS), NO ₃ , NO ₂ -NO ₃ , Fe ⁺² -Fe ⁺³ ,
2. Radiation (rad set 1/1)	SW-846	Gross alpha, gross beta gamma scan, Tc-99, Sr-90 total activity, total Uranium
3. ICP Metals (chem set 1/3)	SW-846	Aluminum, antimony, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, magnesium, manganese, nickel, potassium, silver, sodium, tin, vanadium, and zinc
4. Anions (chem set 2/3)	ASTM or EPA	Bromide, chloride, fluoride, phosphate, sulfate, nitrate, and nitrite
5. Indicator Para (chem set 3/3)	SW-846	TOC/TOX
6. VOA		

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INFORMATION RELEASE REQUEST
PUBLIC DOCUMENT CHANGE/REVISION
(Short Form No. 1)

1. Base Document ID Number: WHC-SD-EN-AP-108, Rev. 0

2. Base Document Title:

ECN # 602620

3. Change/Revision Number:

4. Change/Revision Date: 09/01/94

5. Unclassified Category: * UC -

6. Budget & Reporting Code: * B&R -

I verify this change/revision to the base document indicated above:

- Complies with the provisions of WHC-CM-3-4
- Contains no Limited-Use information
- Contains no classified or Applied Technology references
- Does not change the intent or meaning of the base document
- And, the base document itself is approved for public release.

7. Responsible Manager: ^{for} J. S. Schmid

J.W. Farrett

MSIN: H6-06

Telephone Number: 376-0241

(Signature)

(Date)

8. Information Release Administration Specialist: **

(Signature)

(Date)

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		ECN No. 602620

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